EDUCATIONAL GAMES AND METHODS

Field of the Invention

The invention relates to playing cards and dice sets that enable students to practice mathematical operations (e.g., addition, subtraction, multiplication, division, etc.) involving real numbers while have fun playing card and dice games.

Description of the Prior Art

U.S. Patent Applications 10/264,875 and 10/285,838, which are incorporated herein in their entireties by reference, disclose devices and methods for explaining the addition, subtraction, multiplication, and division of real numbers. The devices and method disclosed in these documents entail the manipulation of positive and/or negative units.

Summary of the Invention

There is a need to transition students from manipulating positive and/or negative units when adding, subtracting, multiplying, and/or dividing real numbers to being able to perform such math operations mentally.

The present invention solves the need set forth in the preceding paragraph by providing playing cards and diced sets that enable students to mentally add, subtract, multiply, and/or divide real numbers while have fun playing games. In a first embodiment, the invention provides a deck of playing cards comprising at least a first set of playing cards and a second set of playing cards, where (a) each set comprises 2M + 1 playing cards; (b) each playing card

of each set comprises a playing face and a rear face; (c) each playing face of each playing card of the first set displays an integer within the range of –M to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the first set; (d) each playing face of each playing card of the second set displays an integer within the range of –M to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the second set; and (e) M is an integer at least equal to 10.

In a second embodiment, the invention provides a dice game apparatus comprising at least a first numerical die having N_1 faces, where (a) N_1 is an integer at least equal to 10; and (b) each face of the first numerical die bears a different first integer within the range of -1 to $-N_1$

Optionally, the dice game apparatus further comprises at least one additional numerical die selected from the group consisting of a second numerical die having N_2 faces, a third numerical die having N_3 faces, and a fourth numerical die having N_4 faces, where (c) N_2 is an integer at least equal to 10; (d) each face of the second numerical die bears a different second integer within the range of -1 to $-N_2$; (e) N_3 is an integer at least equal to 10; (f) each face of the third numerical die bears a different third integer within the range of 1 to N_3; (g) N_4 is an integer at least equal to 10; and (h) each face of the fourth numerical die bears a different fourth integer within the range of 1 to N_4.

It is also desirable that the dice game apparatus further comprise at least one operator die selected from the group consisting of a first operator die having O_1 faces and a second operator die having O_2 faces, where (i) O_1 is an integer at least equal to 10; (j) X_1 faces of the first operator die bear a fifth indicia representing the mathematical operation of addition, with X_1 being an integer from 1 to $2/3O_1$; (k) Y_1 faces of the first operator die bear a sixth indicia

representing the mathematical operation of subtraction, with Y_1 being an integer from 1 to $2/3O_1$; (l) Z_1 faces of the first operator die bear a seventh indicia representing mathematical operations (e.g., addition, subtraction, multiplication, and division) that a player can choose, with Z_1 being an integer from 0 to $2/3O_1$; (m) $X_1 + Y_1 + Z_1 = O_1$; (n) O_2 is an integer at least equal to 10; (o) X_2 faces of the second operator die bear an eighth indicia representing the mathematical operation of addition, with X_2 being an integer from 1 to $2/3O_2$; (p) Y_2 faces of the second operator die bear a ninth indicia representing the mathematical operation of subtraction, with Y_2 being an integer from 1 to $2/3O_2$; (q) Z_2 faces of the second operator die bear a tenth indicia representing mathematical operations (e.g., addition, subtraction, multiplication, and division) that a player can choose, with Z_2 being an integer from 0 to $2/3O_2$; (r) A_2 faces of the second operator die bear an eleventh indicia representing the mathematical operation of multiplication, with A_2 being an integer from 1 to $2/3O_2$; and (s) $X_2 + Y_2 + Z_2 + A_2 = O_2$.

Most preferably, the dice game apparatus comprises the first numerical die, the second numerical die, the third numerical die, the fourth numerical die, the first operator die, and the second operator die.

The dice game apparatus can be used in a method comprising at least the steps of (a) rolling at least two numerical dice with one of the numerical die being the first numerical die and the other numerical die being selected from the group consisting of the second numerical die, the third numerical, and the fourth numerical die; (b) rolling an operator die selected from the group consisting of the first operator die and the second operator die; and (c) solving the mathematical problem posed by the uppermost indicia on the two numerical dice and the operator die.

Students not yet ready to deal with negative numbers can practice adding, subtracting, multiplying, and dividing just positive numbers with a deck of playing card comprising at least a first set of playing cards and a second set of playing cards, where (a) each set comprises M + 1 playing cards; (b) each playing card of each set comprises a playing face and a rear face; (c) each playing face of each playing card of the first set displays an integer within the range of 0 to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the first set; (d) each playing face of each playing card of the second set displays an integer within the range of 0 to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the second set; and (e) M is an integer at least equal to 10. Preferably, in this version of the invention M equals 12 and the deck further comprises a third set of playing cards and a fourth set of playing cards, where (f) each playing face of each playing card of the third set displays an integer within the range of 0 to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the third set; and (g) each playing face of each playing card of the fourth set displays an integer within the range of 0 to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the fourth set.

Brief Description of the Drawings

Various embodiments of the present invention are shown in the drawings where:

Figure 1 depicts the playing face of a playing card bearing a negative number;

Figure 2 depicts the playing face of a playing card bearing a positive number;

Figure 3 depicts the playing face of a playing card bearing pictorial and symbolic indicia of the same positive number;

Figure 4 is a two-dimensional view of a layout for a negative number dodecahedron die bearing negative numbers -1 through -12;

Figure 5 is a two-dimensional view of a layout for a positive number dodecahedron die bearing positive numbers 1 through 12;

Figure 6 is a two-dimensional view of a layout for a first dodecahedron operator die bearing various mathematical operations; and

Figure 7 is a two-dimensional view of a layout for a second dodecahedron operator die bearing various mathematical operations.

In Figures 1-7, the same reference numbers represent the same element.

Detailed Description of the Invention

With respect to Figure 1, a playing card 10 suitable for use in a real number deck within the scope of the present invention has a single negative number 2 on the playing face 3 of the card 10. In the example shown in Figure 1, the single negative number 2 is -12 and is present in the upper left hand corner 4, the upper right hand corner 5, the lower left hand corner 6, and the lower right hand corner 7 of the playing face 3. Preferably, the playing face 3 of the playing card 10 is substantially devoid (and more preferably, totally devoid) of any

graphics other than the single negative number 2. In other words, the playing face 3 of the playing card 10 consists essentially of (and more preferably, consists of) the single negative number 2.

In Figure 2, a playing card 20 also suitable for use in a real number deck within the scope of the present invention has a single positive number 21 on the playing face 3 of the card 20. In the example shown in Figure 2, the single positive number 21 is 12 and is present in the upper left hand corner 4, the upper right hand corner 5, the lower left hand corner 6, and the lower right hand corner 7 of the playing face 3. In this embodiment of the invention, the playing face 3 of the playing card 20 preferably consists essentially of (and more preferably, consists of) the single positive number 21.

The real number deck preferably comprises two or more sets of playing cards. Each playing face of each playing card of each set displays an integer within the range of –M to M which is different from all the other integers displayed on all the other playing faces of the playing cards of the respective set. Preferably, M is an integer at least equal to 10, more preferably equal to 12, and most preferably equal to 13. Table I, below, shows the single number on each face of each of the 27 playing cards present in each of the two sets that make up a preferred real number deck within the scope of the present invention.

TABLE I

Numbers Appearing on the Faces of the Playing Cards of a Real Number Deck

1st Set	2nd Set	1st Set	2nd Set	1st Set	2nd Set	1st Set	2nd Set
-13	-13	-12	-12	-11	-11	-10	-10
-9	-9	-8	-8	-7	-7	-6	-6
-5	-5	-4	-4	-3	-3	-2	-2

TABLE I (continued)

Numbers Appearing on the Faces of the Playing Cards of Real Number Deck

1st Set	2nd Set	1st Set	2nd Set	1st Set	2nd Set	1st Set	2nd Set
-1	-1	0	0	1	1	2	2
3	3	4	4	5	5	6	6
7	7	8	8	9	9	10	10
11	11	12	12	13	13		

In another version of the invention, the playing faces of the playing cards of each set only bear integers within the range of 0 to M, where M is as defined above. In this positive number deck version of the invention, the positive number decks preferably comprise four sets of playing cards. Table II, below, shows the single number on each face of each of the 13 playing cards present in each of the four sets that make up a preferred positive number deck within the scope of the invention.

TABLE II

Numbers Appearing on the Faces of the Playing Cards of a Positive Number Deck

1st Set	2nd Set	3rd Set	4th Set	1st Set	2nd Set	3rd Set	4th Set
0	0	0	0	1	1	1	1
2	2	2	2	3	3	3	3
4	4	4	4	5	5	5	5
6	6	6	6	7	7	7	7
8	8	8	8	9	9	9	9
10	10	10	10	11	11	11	11
12	12	12	12				

As shown in Figure 3, in the positive number deck version of the invention, the positive number on the playing face 3 of the playing card 30 alternatively can be represented in the form of a symbolic indicia of numerical value 21 (namely, the Arabic positive number 12) and in the form of a pictorial indicia of the same numerical value 31 (namely, a grid consisting of 12 dots). An alternative version of the positive number deck is described in U.S. Patent Application 10/440,764, which is incorporated herein in its entirety by reference.

Optionally, the real and positive number decks also comprise one or more Joker cards and one or more instructional and/or informational cards.

While the playing cards 10, 20, and 30 used in the decks of the present invention can be of any size, they are preferably the size of a standard poker or bridge card.

The decks can be manufactured by techniques well know to those skilled in the art and can be used to play numerous card games. For example, students can practice number recognition and number sequencing by playing classical card games such as War, Concentration (a.k.a. Memory), Go Fish, Old Maid, Rummy, Gin Rummy, Solitaire, and Spit. Likewise, students can practice their addition skills by playing the classical card game 21 or the card game described below in Example 1.

Example 1 - Addition War

Addition War is played similarly to War with the differences being that each player plays two cards at a time and adds the numbers on the face of the two played cards. The player with the highest sum wins.

Similarly, students can practice their subtraction skills by playing the card games described below in Examples 2 - 3.

Example 2 - Zero™

Zero is played similarly to 21 with a number of differences. One difference is that the numbers on faces of the cards are subtracted in the order that they are dealt. Alternatively, the lower number on the faces of the two initially dealt cards is subtracted from the higher number and the number on the face of each subsequently dealt is subtracted from the difference resulting from the prior subtraction operation. Another difference is that the object of the game is to get a difference equal to or as close as possible to 0 without going below 0.

Example 3 -Subtraction War

Subtraction War is played similarly to War with some modifications. In Subtraction War, each player plays two cards at a time and, depending on what is decided at the start of the game, either subtracts the lower number from the higher number or subtracts the number on the second dealt card from the number on the first dealt card. The player with the smallest absolute difference wins.

Also, students can practice their multiplication skills by playing the card game described below in Example 4.

Example 4 - Multiplication War

Multiplication War is played similarly to War but each player plays two cards at a time and multiplies the face-up numbers on the two played cards. The player with the highest product wins.

Furthermore, students can simultaneously practice their addition and subtraction skills by playing the card game described below in Example 5.

Example 5 - Additracion™

A player deals the deck of playing cards, facedown, evenly among all the players. The players keep their respective cards facedown in their pile and sequentially perform the following steps:

1. Each player plays two cards face-up from the top of the player's pile.
2. Each player adds the two face-up numbers of the two cards to obtain a sum.
3. Each player subtracts the lower face-up number from the high face-up number to obtain a difference.

The player who obtains the highest sum in step 2 and the smallest difference in step 3 takes all the cards played in that round. If neither player obtains the highest sum in step 2 and the smallest difference in step 3 or if both players obtain the same sum in step 2 and the same difference in step 3, neither player takes the cards played that round and those cards form a pot that goes to the player who first wins a subsequent round.

End Game: Additraction ends after all the cards have been played one time. The player with the most cards wins.

In a similar fashion, students can simultaneously practice their multiplication and division skills by playing the card game described below in Example 6.

Example 6 - Pendulum™

All 0 numbered playing cards are remove from the deck. A player shuffles the deck well, deals seven playing cards to each player, and places the remainder of the deck facedown on the table between the players. The players then perform the following sequence of steps:

1. Player A takes one card from his or her hand and places it face-up on the table.
2. Player B takes one card from the deck, places that card or any one card from his or her hand face-up on the table next to card played in step 1, and states the product of the numbers appearing on the faces of the cards played in steps 1 and 2.
3. Player A takes one card from the deck, places it in his or her hand, takes any playing card that displays a number on its face that is completely divisible (with no remainder) into the product stated in step 2, states how many times it is divisible into the product, and places the playing card on the table to start a pile.
4. Player B takes one card from the deck, places it in his or her hand, takes any playing card that displays a number on its face that is completely divisible (with no remainder) into the product stated in step 2, states how many times it is divisible into the product, and places the playing card on top of the pile.

5. If after a player (e.g., Player A) takes one card from the deck, he or she cannot play any card that displays a number that is completely divisible into the product stated in step 2, play returns to the other player (e.g., Player B) who can then play another card that displays a number that is completely divisible into the product stated in step 2. If Player B again plays another card that displays a number that is completely divisible into the product stated in step 2, Player A takes another card from the deck.

6. Steps 3-5 are repeated until neither Player A nor Player B has any playing card that displays a number that is completely divisible into the product stated in step 2.

If a player states an incorrect product or an incorrect divisor or quotient, that player returns the card he or she played to his or her hand, takes one card from the deck, and play advances to the other player.

End Game: The first player to discard all the cards in his or her hand wins the round. However, if play ends at step 6 with neither player having any playing card that displays a number that is capable of being completely divisible into the product stated in step 2, then the player with the least number of playing cards in his or her hand wins.

Students desiring to simultaneously practice their addition, subtraction, and multiplication skills can play the card game described below in Example 7.

Example 7 - Trimathlon™

A player deals the deck of playing cards, facedown, evenly among all the players. The players keep their respective cards facedown in their pile and sequentially perform the following steps:

1. Each player plays a first card face-up from the top of the player's pile.
2. Each player plays a second card face-up from the top of the player's pile and adds the first and second face-up numbers.
3. Each player plays a third card face-up from the top of the player's pile and subtracts the face-up number on third card from the sum obtained is above step 2.
4. Each player plays a fourth card face-up from the top of the player's pile and multiplies the face-up number on the forth card and the difference obtained in above step 3.

The player whose product obtained in step 4 yields the highest number takes all the cards played in that round. If both players obtain the same product in step 4, neither player takes the cards played that round and those cards form a pot that goes to the player who first wins a subsequent round.

End Game: Trimathlon ends after all the cards have been played one time. The player with the most cards wins.

Students can play the card game described below in Example 8 to simultaneously practice their addition, subtraction, multiplication, division, and other math skills.

Example 8 - Dejá Vu™

Players A and B are dealt 7 cards facedown. The undealt cards are placed in a pile facedown on a table.

Player A and B pick up the cards and organize them in their hands.

Player A places one playing card on the table. (For example, Player A puts down a 9.) Player B can do one or more of the following:

a. Put down one or more cards whose face number is the same as the number specified by the player (e.g., put down a card whose face number is 9);

b. Put down two or more cards whose sum is the same as the number specified by the player (e.g., put down two or more cards whose face numbers when added equal 9 (such as 5 + 4));

c. Put down two or more cards whose difference is the same as the number specified by the player (e.g., put down two or more cards whose face numbers when subtracted equal 9 (such as 12 -3));

d. Put down two or more cards whose product is the same as the number specified by the player (e.g., put down two or more cards whose face numbers when multiplied equal 9 (such as 9 x 1));

e. Put down two or more cards whose quotient is the same as the number specified by the player (e.g., put down two or more cards whose face numbers when divided equal 9 (such as 9/1));

f. Put down two or more cards whose face numbers when subjected to any other math operation (e.g., exponential operation, etc.) is the same as the number specified by the player (e.g., put down two or more cards whose face numbers when subjected to an exponential operation equal 9 (such as 3^2); and/or

g. Put down three or more cards whose face numbers when subjected to any combination of two or more math operations is the same as the number specified by the player (e.g., put down three or more cards whose face numbers when subjected to at least two math operations equal 9 (such as ((10 x 5) + 4)/6).

If Player B is unable to do any of above operations a – g, Player B takes one card from the pile.

For each operation a – g that Player B is able to do, Player B puts down the pertinent cards from his or her hand and explains how the specified number is obtained. Player A can point out that Player B's solution is incorrect. If Player B's solution is incorrect, Player B returns the cards used to formulate the incorrect solution to his hand and takes one card from the pile. However, if Player B's solution is correct, Player A takes one card from the pile.

Player B takes one card from the deck for the card initially put down by Player A and, Player A takes one card from the deck for each card that Player B was able to correctly put down during Player B's turn.

Players A and B then take turns alternating their respective roles.

End Game: Dejá Vu ends when either of the following occurs first:

i. The first player to get rid of all the cards in his or her hand wins.

ii. If the players are unable to get rid of all the cards in their hands before the pile of undealt cards becomes exhausted, the game ends in a draw.

Another embodiment of the present invention pertains to a real number dice game apparatus. Some aspects of this embodiment are described in detail in U.S. Application Serial No. 10/213,831, which is also incorporated herein in its entirety by reference. In particular, the dice game apparatus of the present invention comprises at least one set of dice, where each set of dice comprises (a) a first positive numerical die, (b) a second positive numerical die, (c) a first

negative numerical die, (d) a second negative numerical die, and (e) at least one operator die selected from the group consisting of a first operator die and a second operator die. Preferably, the dice game apparatus consists essentially of (and, more preferably, consists of) (a) the first positive numerical die, (b) the second positive numerical die, (c) the first negative numerical die, (d) the second negative numerical die, and (e) at least one operator die selected from the group consisting of a first operator die and a second operator die.

While decahedron and dodecahedron dice are preferably employed in the dice game apparatus of the invention, dice sets employing dodecahedron dice are described in detail below to illustrate this embodiment of the invention.

Figure 4 shows a negative number dodecahedron die 40 bearing negative numbers -1 through -12. Each dodecahedron dice set comprises at least two negative number dodecahedron dice 40.

Figure 5 shows a positive number dodecahedron die 50 bearing positive numbers 1 through 12. Each dodecahedron dice set comprises at least two positive number dodecahedron dice 50.

Figure 6 shows a first operator dodecahedron die 60 bearing indicia representing mathematical operations such as addition 61, subtraction 62, and mathematical operations of choice 63 (i.e., mathematical operations such as addition, subtraction, multiplication, and division that can be chosen by a player). Preferably, X_1 faces of the first operator die bear an indicia 61 representing the mathematical operation of addition, with X_1 being a whole number from 1 to $2/3O_1$; Y_1 faces of the first operator die bear an indicia 62 representing the mathematical operation of subtraction, with Y_1 being a whole number from 1 to $2/3O_1$; Z_1 faces of the first operator die bear an indicia 63 representing

mathematical operations of choice that can be chosen by a player, with Z_1 being a whole number from 0 to $2/3O_1$; and $X_1 + Y_1 + Z_1 = O_1$, with O_1 being equal to 12. (When a decahedron die is employed, O_1 is equal to 10.) Each dodecahedron dice set preferably comprises at least one first operator dodecahedron die 60.

Figure 7 shows a second operator dodecahedron die 70 bearing indicia representing mathematical operations such as addition 61, subtraction 62, mathematical operations of choice 63, and multiplication 71. Preferably, X_2 faces of the second operator die bear an indicia 61 representing the mathematical operation of addition, with X_2 being a whole number from 1 to $2/3O_1$; Y_2 faces of the second operator die bear an indicia 62 representing the mathematical operation of subtraction, with Y_2 being a whole number from 1 to $2/3O_1$; Z_2 faces of the second operator die bear an indicia 63 representing mathematical operations of choice that can be chosen by a player, with Z_2 being a whole number from 0 to $2/3O_1$; A_2 faces of the second operator die bear an indicia 71 representing the mathematical operation of multiplication, with A_2 being a whole number from 1 to $2/3O_2$; and $X_2 + Y_2 + Z_2 + A_2 = O_2$, with O_2 being equal to 12. (When a decahedron die is employed, O_2 is equal to 10.) Each dodecahedron dice set preferably comprises at least one second operator dodecahedron die 70.

The dice games of the present invention are played by one or more players who take turns rolling three dice, namely, two numerical dice selected from the group consisting of (a) the first positive numerical die, (b) the second positive numerical die, (c) the first negative numerical die, and (d) the second negative numerical die and one operator die selected from the group consisting of the first and second operator dice. (The two numerical dice are typically selected at random, but preferably at least one numerical die is a negative numerical die.) Generally, the three dice are rolled substantially simultaneously.

The player who rolled the dice gives the answer to the mathematical problem posed by the two numerals on the uppermost faces of the two numerical dice operated upon by the mathematical function shown on the uppermost face of the single operator die. A player is awarded one point for each correct answer that the player gives and play advances to the next player. (If the uppermost face of the single operator die is a mathematical operation of choice 63, the player receives one point for each correct mathematical operation that he or she performs during his or her turn.) If the player gives the wrong answer, play advances to the next player who must then give an answer to the mathematical problem posed by the dice rolled by the previous player. If the subsequent player gives the right answer, he or she is awarded one point for each correct answer he or she gives and is allowed to roll the dice and answer the new problem posed by the rolled dice before play again advances to the next player. However, if the subsequent player also gives the wrong answer, play again advances to the next player as described above.

While the preferred embodiments of the invention are set forth above in detail, some modifications can be made without departing from the spirit of the present invention. For example, hexahedron and octahedron dice can also be employed in the dice sets of the present invention. Likewise, a plurality of decks can be employed in playing card games. In addition, the steps employed in the card games described in above Examples 1 – 8 can be modified. Also, the real number deck of cards can comprise at least for sets of cards. Accordingly, modifications within the spirit of the present invention are included within the scope of the present invention.